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THE PLAGUE OF FIELD VOLES IN SCOTLAND.

REPORT OF THE COMMITTEE APPOINTED BY THE BOARD OF AGRICULTURE.

THE Committee appointed to inquire into and report upon the circumstances attending the plague of voles in some of the southern counties of Scotland, and to ascertain, either experimentally or otherwise as they might determine, whether any, and, if so, what preventive and remedial measures could be adopted, having conducted their inquiry to certain conclusions, submit the following Report.

Before proceeding to the infected district we received evidence from Major Craigie, of the Intelligence Department of the Board of Agriculture, who stated that his attention had not been called to the existence of the plague of voles until the winter 1891-92, when it had been in existence for a considerable time. He laid before us the reports of two of the local inspectors of the Board, Mr. R. F. Dudgeon and Mr. J. I. Davidson, who, early in 1892, had been directed to inquire into the extent of the outbreak in the counties affected. We also received through the Office of Woods and Forests copies of correspondence relating to former outbreaks of the kind in England, and through the Foreign Office information of similar plagues in other European countries.

Hereafter, we proceeded to the infected district and received evidence from farmers, shepherds, land agents, gamekeepers, naturalists, and others at Howpasley on 20th June, at Hawick on 21st June, at Moffat on 22nd June, and at Thornhill on 23rd June.

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We also inspected the farm of Howpasley, about twelve miles from Hawick, which was said to have suffered as severely as any from the ravages of voles.

Nature and Origin of the Plague.—The animal which by excessive multiplication has caused so much mischief on hill-farms in the southern uplands of Scotland is the Short-tailed Field Vole, *Arvicola agrestis*. Of this vole an excellent and exhaustive account was contributed to the 'Proceedings of the Berwickshire Naturalists' Club,' in 1878, by the late Sir Walter Elliot.

This Field Vole is at all seasons a well-known inhabitant of our pastures, and may be found at all heights from the sea-level to near the summits of our highest hills. The Chairman of the Committee saw one in the autumn of 1891 at a height of 2000 feet on Ben Eibhinn, in Strath Ossian. The attention of farmers and shepherds is only attracted to it when circumstances have combined to cause an abnormal increase in its numbers. One shepherd stated that when as a boy he used to find a nest of voles he would "hap" (protect) it, because it was thought rare.

The Field Vole usually produces three or four litters a year, each consisting of from four to eight young, but in some seasons they are even more prolific, the breeding season is prolonged, young voles being observed from February to November, and the litters containing as many as ten young. Mr. Service, of Maxwelltown, a local naturalist and careful observer, mentioned in his evidence that he had observed females suckling young while in a pregnant state.

The present outbreak may be traced back to the year 1888, when the voles were observed to be increasing on the farm of Glenkerry and others in Selkirkshire. In the summer of 1889 the low-lying pastures near Closeburn, in Dumfriesshire, were observed to be infested by enormous numbers of voles, which remained there during 1890, and disappeared in 1891, probably moving up to the hill-pastures, where at the time of the Committee's visit they were swarming.

On some of the hill-farms this excessive increase was observed as early as the autumn of 1890; elsewhere, however, they attracted no attention till the spring of 1891. The districts principally affected are the hill-pastures in the north-west of Roxburghshire, the south of the counties of Selkirk, Peebles, and Lanark, and the northern part of Dumfries from Eskdalemuir by Moffat to

Thornhill. The voles have also appeared in great numbers in the parishes of Dalry and Carsphairn, in the stewartry of Kirkcudbright.

Mr. R. F. Dudgeon, at the date of his report, estimated that in Roxburghshire 30,000 to 40,000 acres had been affected, of which he considered 12,000 to 15,000 acres had been rendered useless; in Dumfriesshire 40,000 to 50,000 acres, and in the stewartry of Kirkcudbright 10,000 to 12,000 acres were described by him as infested by voles.

The Committee received no estimate of the area affected in the counties of Selkirk, Peebles, and Lanark, nor had they the means of verifying Mr. Dudgeon's calculation in respect to the other counties affected, but an area not less than sixty miles in length and from twelve to twenty miles in breadth has been overrun.

Causes of the Outbreak.—The rapid increase in the number of voles to the dimensions of a plague was attributed by all the witnesses examined to one of two causes, or to a combination of both. The first of these consists in the character of the seasons. Mr. Service called attention to the occurrence of a series of dry springs in 1890, 1891, and 1892, adducing figures to show that the rainfall in these seasons was very much below the average, and therefore favourable, in his opinion, to the breeding of small mammals. The autumn of 1890 was unusually wet, producing great luxuriance of grass on the hill-pastures, which afforded abundant shelter for the voles. The winter which followed, though very severe in England, was a mild one in Scotland. Sir Walter Elliot traced the cause of the outbreak of voles which took place in 1876 to the unusual mildness of the four or five winters preceding that year.

The second cause assigned by witnesses is the destruction of hawks, buzzards, owls, stoats, and weasels by persons interested in the preservation of game. Major Craigie had previously stated that "a preponderance of opinion amongst farmers is reported, tracing the cause of the present outbreak to the scarcity of owls, kestrels, hawks, weasels, and other vermin." Of the prevalence of this opinion the Committee were made fully aware, nearly every witness who was examined giving it as his belief that the outbreak was due to the destruction of the "natural enemies" of the voles. A similar view was expressed by the witnesses before the Com-

mittee of the Tiviotdale Farmers' Club appointed to inquire into the cause of the outbreak in 1876; but Sir Walter Elliot stated that much weight was not attached to this "popular opinion . . . because no more hawks, owls, weasels, &c., had been destroyed than usual." They had, in fact (to use Sir Walter Elliot's own words), "been well nigh extirpated long before the outbreak took place."

Effect upon the Pasture.—Of the damage done to the hill-pastures the Committee had ocular demonstration during their visit to Howpasley farm (3000 acres), and nothing short of personal inspection could have given them an adequate idea of the extent of the mischief. The voles had shown themselves there first in what is called the "bog" land—i. e., strong marshy land either grazed or cut for hay. Having devoured the grass there, they spread to the "bent," "lea," or dry hill-pasture, and to the heather, which they destroyed as effectually as they had done the grass. The stem of the grass is eaten close to the ground where it is white and tender, leaving the blade above withered and useless. Plantations are sometimes attacked, the young trees being peeled and killed, but this has not been the case so much during the present outbreak as in former years. The arable land, so far, has not been much affected, but there is no doubt from the experience of Mr. Oliver, who had three acres of corn damaged by them, that, if unchecked, they might swarm upon the cultivated ground with disastrous effect. Indeed, the Committee received information to the effect that in some districts they appeared in numbers in the harvest fields.

In walking across the hill the Committee saw numbers of voles darting about in every direction, and caught several for examination. The grass, which, at the end of June, should have been in full flush of verdure, was lying in withered wisps over a large extent of the farm, and the heather, which is valuable for winter feeding of the stock, had suffered to a similar extent.

Effect on the Stock.—Numerous witnesses spoke to the injury to stock owing to the damaged pasture. This injury was twofold, consisting first in the low condition to which the ewes were reduced, at and after lambing, from insufficiency of food, and the consequent increase of death rate among them; and secondly, in a diminution in the crop of lambs, and deterioration in their quality.

Admitting the serious injury done to the pasture by voles, to which the Committee can testify from personal inspection, it is difficult to avoid the conclusion that the sheep dependent on that pasture must have suffered to a considerable extent. To quote Sir Walter Elliot's words:—

“The importance of these early grasses to flocks emaciated by previous scanty fare, at a time when the ewes, gravid with young, require more than ordinary nourishment to enable them to rear their lambs, explains how disastrous any diminution in their still scanty food might prove, whether from severity of weather, or other unusual cause, such as the swarming of the voles.”

But it is not easy to estimate the extent to which the death rate of the ewes was increased, or the crop of lambs diminished as the direct result of scarcity of pasture caused by the voles.

All witnesses from the infested farms testified to the low condition of the ewes at the time the Committee visited the district, but they varied greatly in their estimate of the increased death rate. One farmer, in the Hawick district, put the deaths at six per cent. above an average, while the tenant of Middlegill, and the shepherd of Medlock, both near Moffat, averred that it had been doubled. The tenant of Ettrick Hall, in the Hawick district, lost 140 ewes out of 1000, whereas the average death rate for the last five years was 45. The tenant of Nether Cassock, in Eskdalemuir, estimated the deterioration on 3000 sheep at 2s. a head in 1891, and at 4s. a head in 1892, or £900 in two years.

The crop of lambs appears to have seriously diminished in consequence of the low condition of the ewes. The shepherd of Rushiegreen, near Hawick, stated that 1400 or 1500 ewes produced 344 lambs fewer than the average. The tenant of Ettrick Hall and Nether Hall, in Selkirkshire, had only 333 lambs, whereas an average would be from 600 to 700. In Dumfriesshire, the tenant of Barr, near Sanquhar, said he had only 60 lambs per 100 ewes, the average being 90. The deficiency was variously calculated at from 15 to 50 per cent. below the average.

In addition to the direct loss suffered by death among the ewes and failure in the lamb crop, there must be reckoned the extra expense incurred in hand-feeding as a substitute for natural pasture. The tenant of Eilrig (1100 acres, present rent £255 10s.) put down the extra cost of this during the winter and spring 1891-92 at £120. The tenant of Howpasley (3000 acres), in

Roxburghshire, calculated his extra expenditure at £144; the tenant of Ettrick Hall and Nether Hall (2400 acres), in Selkirkshire, reckoned that he had spent £100 since January, 1892; while the tenant of Nether Cassock and Glenderg, in Eskdalemuir (6500 acres), estimated the cost of hay and corn supplied during two seasons at £1200. The tenant of Kinnelhead, near Moffat, claimed to have lost £1013 in two years by deaths and cost of hand-feeding. It appears that hand-feeding is never resorted to, unless in exceptional circumstances, such as a prolonged snow-storm, or a failure of pasture such as has been caused by the voles.

Of course, in weighing evidence as to losses by death of ewes and deficiency of lambs, it is necessary to take into account the character of the season. The general testimony throughout the several counties was to the effect that, but for the voles, the lambing season would have been a favourable one, both among Cheviot and black-faced stock. Only two witnesses held a contrary opinion, one an assistant in a land agent's office, the other the tenant of a farm in the Leadhills district.

In order to elicit more general opinion on this subject, the Committee caused a schedule of questions to be circulated among hill-farmers in districts not affected by voles. Nineteen of these were filled up and returned with the following result as to the character of the lambing season:—Very good, 2; good, 6; average, 7; bad, 4.

On the whole, therefore, it may be assumed that the lambing season of 1892 in the south of Scotland was fully of an average character, and the extraordinary death rate among ewes and deterioration in the number and quality of lambs is to be attributed to the scarcity of grass caused by the ravages of the voles.

Remedies.—No concerted or systematic attempt to stamp out the plague in its earlier stages seems to have been undertaken by the farmers of the district affected, and this is the more remarkable because some of them, at all events, had the bitter experience of the outbreak of 1875-76 to warn them of the serious results of allowing the voles to get ahead. Isolated efforts were made by some tenants to rid their land of voles by burning the grass and heather, by killing them with men and dogs, by turning out cats, and by poison; but the effect of such piecemeal endeavours seems

to have been well nigh inappreciable. The Committee are not prepared to declare that landowners and farmers could have arrested the plague, but they hold a very strong opinion that the best chance of averting its disastrous effects would have been for all interested in the ownership and occupation of land to have combined for the destruction of the voles when they were first observed to increase.

Burning bog land, bent, and heather, seem to be effective in driving the voles off the portions burnt. Mr. Carthew Yorstoun, Commissioner on the Duke of Buccleuch's Langholm estate, stated that he had written to every tenant of a hill-farm in 1892, asking if an extension of the time for burning would be an advantage. Three-fourths of those written to replied in the affirmative, and received permission to burn from 14th April (the usual limit) to 28th. The remaining fourth said they had already burned as much as the ground would stand. It is not profitable to burn all the rough pasture on a farm, as the sheep depend on it for sustenance when snow is on the ground.

Poison has been tried with very partial success. Samples of grain treated with strychnine, and coloured red to prevent mistakes, were supplied from Germany and submitted. It is stated that good results were obtained with this in limited areas; for instance, the tenant of Middlegill, near Moffat, holding a farm of 3000 acres, applied this poison to a meadow of ten acres, and thereby partly destroyed the voles. Sir Walter Elliot quoted a letter from Sir Robert Menzies, who describes how he got rid of the voles which infested 140 acres of Scots fir-plantation, by laying down half a ton of half-inch drain pipes, in each of which was placed a teaspoonful of oatmeal mixed with phosphorus. But, for obvious reasons, the application of poisoned grain over hill-farms, extending to many thousands of acres, even if practicable, would be attended with much risk to other forms of life.

Pitfalls—*i. e.*, holes cut in the ground with precipitous sides—are equally out of the question when a large tract of country has to be dealt with. But they have proved effectual when plantations of limited extent have been attacked. The forester at Branxholm within a week exterminated the voles infesting a plantation of six acres, by digging pits 12 inches wide at the mouth, 15 in. wide at the bottom, and 18 in. deep. These were placed at a

distance of from 12 to 20 ft. apart. On the other hand, the head-keeper at Drumlanrig said that pitfalls had been tried without much success in the extensive plantations at that place. As a remedy on sheep farms, pitfalls were graphically appraised thus by Mr. Whittle—"How many holes . . . would it take to cover my farm of 7600 acres, and what would be the cost?"

The same objection—namely, the nature and extent of the ground affected—applies to the proposal of other expedients which have been resorted to in various parts of the Continent, *viz.*, passing a heavy roller over the ground, trampling it with cavalry, inundating it, injecting water, steam, or noxious fumes into the runs. All of these may be dismissed as wholly impracticable.

Large numbers of voles were destroyed on some farms by men and dogs. The vole is extremely rapid in its movements and difficult to hit with a stick. A more effective weapon is a wooden implement shaped like a small spade. The tenant of West Buccleuch, in Selkirkshire, killed by this means 13,000 in three months on 3000 acres; the tenant of Glenkerry (3000 acres) employed a man who killed 15,000 in one month, or about 450 per diem. The tenant of Langshawburn hired a man with twelve terriers, who killed from 400 to 600 a day on 4260 acres. In addition he turned out 100 cats, and by the end of June, 1892, reported that there was not one vole for every 100 that there had been on his ground.

There can be little doubt that simultaneous and combined action of this sort on the part of owners and occupiers, aided by timely and judicious burning *in the earlier stages of the outbreak*, is the most effective method of staying the ravages of the plague. Unfortunately, not only have these exertions been hitherto isolated and intermittent, but they have been delayed until the voles were swarming over a considerable extent of ground.

Previous Outbreaks.—There is abundant evidence to prove that in former times, not only in this country but in many other lands, the excessive pullulation of small rodents has from time to time amounted to a plague.

A passage in Holinshed's 'Chronicle' is worth quoting here, because it records a visitation of Owls similar to that which has taken place in the Border counties during the present outbreak:—

"About Hallontide last past (1581), in the marshes of Danesey Hundred, in a place called South Minster, in the county of Essex . . . there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes, did sheare and gnaw the grass by the rootes, spoyling and tainting the same with their venomous teeth, in such sort that the cattell which grazed thereon were smitten with a murraine and died thereof; which vermine by policie of man could not be destroyed, till at the last there flocked together such a number of owles as all the shire was not able to yield, whereby the marshholders were shortly delivered from the vexation of the said mice."

Stowe, quoting this account in 1615, adds, "the like of this was also in Kent." Childrey, in his 'Britannia Baconica,' 1660, records another outbreak in Essex in 1648, and, referring to the former plague in 1581, remarks that it took place in "an extreme dripping warm year and a mild and moist winter."

Lilly mentions an invasion as having taken place in Essex in 1660; and Fuller, writing in 1662, says:—

"I wish the sad casualties may never return which lately have happened in this county (Essex), the one in 1581, in the Hundred of Dengy; the other in 1648 in the Hundred of Rochford and Isle of Foulness (rented in part by two of my credible parishioners, who attested it, having paid dear for the truth thereof), when an army of mice, resting in the anthills, as conies in burrows, shaved off the grass at the bare roots, which withering to dung, was infectious to cattle. In March following numberless flocks of owls from all parts flew thither and destroyed them, which otherwise had ruined the country if continuing another year."

In 1754, as appears by the 'London Magazine' for that year, and the 'Gentleman's Magazine' (p. 215), a similar occurrence was noted at Downham Market, Norfolk.

Montagu, in the Supplement to his 'Ornithological Dictionary' (1813), quotes Mr. Anstice's description of a plague of mice a few years previously at Bridgewater, followed in like manner by flights of Short-eared Owls.

Other outbreaks occurred in the Forest of Dean and the New Forest in 1813-14, and are fully described in a letter from the late Lord Glenbervie, Surveyor-General of Woods, printed in the Appendix to this Report. In 1836 the Forest of Dean was again infested, but there is some reason to suppose that on this occasion part at least of the mischief was attributable to the Long-tailed Field Mouse, *Mus sylvaticus*.

Destructive visitations of voles took place in 1825, in the oak-coppices of Cameron, Dumbartonshire; and in 1864—67 in the woods of Drumlanrig, Dumfriesshire, when the oak, holly, and ash suffered severely, but the fir and mountain ash were spared. On the other hand, in 1863—64, on the estate of Rannoch, Perthshire, Sir Robert Menzies stated that his woods suffered severely, but that the Scots firs only were attacked.

Finally, there was the serious outbreak on the hill-pastures of Roxburghshire and small portions of Dumfriesshire in 1875—76, by which much of the land suffering under the present visitation was overrun. This is fully described in Sir Walter Elliot's paper above referred to.

Foreign countries have suffered severely under the scourge of swarms of voles nearly akin to, though some of them not identical with, the British species. Simultaneously with the outbreak in Roxburghshire in 1875—76, the corn-lands of Galicia and Hungary were infested by swarms of *Arvicola arvalis*.

During 1891—92 the province of Thessaly was invaded by a plague of rodents, supposed at first to be *Arvicola Savii*, but subsequently identified as *Arvicola Güntheri* (Danford, Proc. Zool. Soc. 1880, p. 62, pl. v.).

In the American continent, also, the land is subject to similar visitations. In his 'Naturalist in La Plata,' Mr. W. H. Hudson gives a graphic description of the Pampas being overrun by swarms of a species of Field Mouse (*Hesperomys*), and mentions the usual concomitant of extraordinary numbers of Short-eared Owls which preyed upon them. In this, as in most of the instances recorded, there is evidence to show that the voles disappeared rapidly, almost suddenly, whether from stress of weather, epizootic disease, or other causes.

Natural Enemies of the Vole.—No phenomenon in connection with the present plague of Field Voles in Scotland has been more marked than the presence of large numbers of the Short-eared Owl, *Otus brachyotus*. This bird, which is distributed over almost every part of the globe, is a normal winter migrant to these islands, appearing simultaneously with the Woodcock (whence it is popularly known as the "Woodcock Owl"), and usually departing in spring. Nests in ordinary seasons are of comparatively rare occurrence in Great Britain; but in consequence of the vast multiplication of their favourite food, the vole, these Owls have

not only arrived in unusual numbers, but have remained and bred freely all over the district affected, laying from eight to thirteen eggs (though Prof. Newton, in his edition of Yarrell's 'British Birds,' mentions seven as an unusual number), and rearing more than one brood. The shepherd on Crooked-stone, near Crauford, counted fourteen nests on his ground. The small wood behind the farm-steading of Howpasley presented a remarkable appearance, the ground being densely covered with the "pellets" or "castings" of owls, composed of the fur and bones of voles. Living specimens of both old and young Short-eared Owls were produced for the inspection of the Committee at Howpasley.

The Short-eared Owl differs from most other Owls in that he hunts in daylight, and his operations can be observed; but there is no doubt that the nocturnal species are equally useful to the farmer in destroying small rodents, and it would be difficult to condemn too severely the foolish and cruel action of those who allow or encourage the destruction of this useful and beautiful family of birds. It is with much satisfaction that the Committee record that many landowners and game preservers seem to have become convinced in late years that Owls of all sorts are not only harmless to game but most beneficial to agriculturists, and have issued orders for the preservation of these birds.

Next, and hardly second in merit, as a check upon voles and mice, comes the Kestrel, *Falco tinnunculus*, and it is to be deplored that popular ignorance as to its food and habits is even greater than that which prevails in regard to owls. This bird, although possessing the long wings and dark eyes characteristic of a true falcon, is known to gamekeepers as a hawk—*noscitur a sociis*; its death-warrant is a standing order in most preserves, though here again there has been some improvement, and the destruction of the Kestrel is forbidden on some estates. The food of this bird is known to consist almost exclusively of mice, grasshoppers, coleopterous insects, and their larvæ.

It is true that one witness, a tenant of shootings, stated his belief that the Kestrel is a "deadly enemy of game," that one of this species took seventy young pheasants from the coops, and was shot one evening in the act of carrying off a young pheasant. But he was not speaking from observation, but from the report of his keeper, and there is little doubt that Kestrels are often

attracted to pheasant coops by the presence of rats and mice drawn thither by the food prepared for the young birds. Against this may be set the evidence of the head-keeper at Drumlanrig (where Kestrels are preserved by order of the Duke of Buccleuch), who said that in his experience of over thirty years he thought he could remember twice seeing a Kestrel taking a young pheasant.

It will be a very gratifying result of the present inquiry if it tends to persuade persons interested in game preserving that the Kestrel preys not so much on game as on the vermin of the farm.

It may be observed, in connection with this question of the Kestrel's habits, that it is rare to find people able to distinguish between one kind of hawk and another. Few of the witnesses before the Committee were able to describe hawks otherwise than as red, blue, brown, or yellow, and it was often impossible to make out what species they intended to indicate. It is one of the peculiarities of the *Falconidae* that their plumage varies according to age and sex. In the southern counties of Scotland the Sparrowhawk (which does not prey on mice) is generally known as the "blue hawk," and the Kestrel as the "brown" or "red" hawk. But an immature male Sparrowhawk has reddish brown plumage, and an adult male Kestrel a bluish grey head, lower back, and tail.

Several witnesses deponed to an increase in hawks "since the mice came," but were unable to identify the species. No doubt they were Kestrels, for other species of hawks do not commonly prey on mice, and the Committee, in driving back from Howpasley, observed five Kestrels together hovering over the vole-haunted ground.

Buzzards probably destroy large numbers of voles and mice, and are too heavy on the wing to do much injury to winged game; but they have become very scarce in southern Scotland, owing to their destruction by gamekeepers.

Ravens and Hooded Crows have also become rare, but this cannot be regretted in the farmer's interest, as they attack young lambs, and even pick the eyes out of the weakly ewes. Moreover the Rooks, which it is to be hoped no short-sighted policy will greatly reduce in numbers, have done excellent service in digging up the voles' nests and devouring the young.

Mr. Service, of Maxwelltown, drew attention to a change which had taken place in the habit of Rooks in his neighbour-

hood during the last ten years, having "developed most marked carnivorous habits, taking eggs, young birds, young poultry, young hares and rabbits, to an extent they never did before." Simultaneously with this manifestation of Carrion Crow-like habits, Mr. Service had noticed an increase in the number of Rooks with feathered faces like the Carrion Crow, which he was inclined to connect with the change of their diet. (See Stevenson's 'Birds of Norfolk,' vol. i. pp. 274, 275.)

This alleged modification in the habits of the Rook, though favourable to the farmer, has not unreasonably brought him into evil repute with game-preservers.

Amongst other birds which have been observed to prey on voles are certain species of Sea-gull.

Stoats and Weasels are among the deadliest and most persevering enemies of small rodents. They kill far more than they can devour, apparently out of sheer blood-thirstiness. In woodlands and on low ground they undoubtedly do much harm to game, especially the Stoat, which may be easily distinguished from the Weasel (known in Scotland as the "whittret") by its greater size and by the black tuft at the end of the tail, which is retained at all seasons of the year, even in winter, when the rest of the body becomes wholly or partially white.

Adders feed readily on voles, and in July, 1892, the Chairman of the Committee was present when one was killed with a vole in its gullet. This was in Wigtonshire, where no abnormal increase in the number of voles has been observed. But a single Adder would probably not kill more than one animal of the size of a vole in a single day: so there is no reason to extend protection to these venomous reptiles.

Some naturalists aver that the Mole preys upon voles; but the Committee, though directing inquiries upon this point, were unable to elicit any evidence tending to confirm this belief.

The popular opinion that the excessive multiplication of Field Voles is the direct result of the destruction of birds of prey, Stoats and Weasels, which has been admittedly great over part of the affected area, does not appear to be generally the outcome of personal accurate observation.

The Committee are of opinion that birds and beasts of prey, even had they been wholly unmolested, would not have prevailed to avert the vole plague, though they would probably have greatly

mitigated its severity, and they are confirmed in this view by the circumstances attending similar outbreaks in this country in the 16th and 17th centuries, and in foreign countries of late years. Neither in Essex, previous to the outbreak reported by Hollinshed, nor in South America previous to the outbreak of Field Mice described by Mr. Hudson in the 'Naturalist in La Plata,' nor in Thessaly, previous to that prevalent there in 1891-92, was there any check placed by man upon the multiplication of the natural enemies of these rodents.

In reply to the question (*inter alia*) whether "birds of prey and other rapacious animals have assisted to any material extent in the destruction of the voles (in Thessaly)," Her Majesty's Minister at Athens replied, "Birds of prey and other rapacious animals would never suffice to prevent the alarming multiplication of the voles under favourable climatic conditions."

This view has been amply confirmed by the observations of the Chairman and Secretary of the Committee during their recent visit to the infested plains of Thessaly. Birds of prey—eagles, buzzards, kites, kestrels, and other hawks—are exceedingly abundant there, and no one thinks of molesting them. Indeed, the Turks (of whom there are about 30,000 in the province) are exceedingly kind to wild animals, and object to their being destroyed. In 1866, when that country last suffered from a visitation of Field Voles, Thessaly was under Turkish dominion, and birds of prey were protected. The change from Turkish to Greek rule, which took place in 1881, made no difference in this respect, yet in favourable seasons the voles multiply in spite of the presence of a very full stock of their natural enemies.

Conclusions and Recommendations.—The Committee have reluctantly been led to the conclusion that they are unable to recommend any specific method of dealing with or putting an end to the present outbreak. It appears to be an instance of the power which small animals are well known to possess, of prodigiously rapid multiplication under favourable climatic conditions and with a plentiful supply of natural food.

Experience shows that a combination of such favourable conditions will always tend to bring about a recurrence of the plague. That being so, it ought to be the endeavour of every farmer and shepherd to be on the alert, and report without delay to the land agent, and to the secretary of the local farmers' club

or agricultural society, the first signs of the multiplication of vermin, so that palliative measures may at once be adopted, not on isolated farms, but everywhere throughout the district.

The most effective measures appear to be periodical and timely *burning* of grass and heather, followed by active pursuit of the vermin by men using wooden spades and dogs. If this were promptly done in the earlier stages of the outbreak, it is quite possible that it might be averted altogether, or greatly mitigated in severity.

It is hardly necessary to point out that the proprietor of the land should be informed as soon as anyone else, because his keepers and others might be usefully employed in assisting to prevent what amounts, if unchecked, to a common calamity upon all classes connected with land.

Where plantations of limited extent are attacked, *pitfalls* wider at the bottom than at the top, and about eighteen inches deep, should be dug. The voles fall into them and cannot escape, and the ground is soon cleared of them in this way.

The Committee cannot speak with approval of the use of *poisoned grain*, except where the area affected is very limited.

Nor have they been able to come to any conclusion favourable to the adoption of *Professor Loeffler's method* of destroying voles by means of bread saturated in a preparation of the *bacillus typhi murium*, or mouse typhus. The personal investigations made by the Chairman and Secretary in Thessaly (where in May, 1892, Prof. Loeffler was employed at the expense of the Greek Government to combat the plague of Field Voles then prevailing in that country) convinced them that the favourable reports circulated as to the complete success of the experiments have not been justified by the results. In certain parts of Thessaly the voles were reported by landowners and others to be as numerous in January, 1893, as ever they were.

The Committee readily admit that when used in a fresh state the bacilliferous fluid is an effective though somewhat dilatory poison for mice or voles, and has this advantage over mineral poisons, that, as has been proved, it is innocuous to human and other forms of life.

It has been reported by Prof. Loeffler that the Scottish voles sent to him alive by instructions from the Committee have been found as susceptible of the mouse typhus-bacillus as their Greek

congeners. But there are three objections which in the opinion of the Committee render this method almost worthless, except for employment in houses, gardens, enclosed fields, or other limited areas:—

(1). It is very expensive; the virus supplied to the Greek Government was paid for at the rate of about 4s. a tube, containing enough when dissolved to treat about two imperial acres—a cost which in many instances would exceed the rent of the Scottish hill-pasture. To this must be added the price of bread used in distributing the virus, which would appreciably raise the cost of the process. Thus to deal effectually with a hill-farm of (say) 6000 acres, would entail an expenditure of from £700 to £1000, making the remedy more costly than the evil.

(2). Mouse-typhus is not contagious; it can only be communicated to those animals that will swallow some of the virus. The allegation that healthy voles will become infected by devouring the bodies of the dead has not been satisfactorily proved. That Greek voles when in captivity have been observed to feed upon the corpses of their fellows hardly warrants the assumption that Scottish voles in a state of liberty will do the same; and unless the disease were communicable from one animal to the other, it is not easy to see how the remedy could prove effective on extensive hill-pastures.

(3). The fluid loses its value in about eight days after preparation. Consequently much disappointment might ensue if, after a supply had been obtained, a fall of snow or wet weather were to interfere with its distribution over the land.

The remedy which has been found most effectual in Thessaly is an injection of the fumes of *bisulphide of carbon* into the burrows. This, however, is a more expensive process than the other, besides being injurious to the health of those engaged in its application. It is, moreover, inapplicable to the Scottish vole (*Arvicola agrestis*), which does not burrow to a depth like the vole of Thessaly (*Arvicola Güntheri*), but lives in shallow runs amongst the roots of herbage.

With the under-noted exceptions, the natural enemies of the voles may be divided into two classes, *viz.*, those which destroy the voles and are harmless to sheep, crops, and game; and those which, through preying on voles, are so hurtful in other ways as to have no claim to preservation:—

- | | |
|---|---|
| (i.) <i>Vole-killers, harmless or nearly so,
to sheep, crops, and game.</i> | (ii.) <i>Vole-killers, hurtful in other
ways.</i> |
| Owls of all sorts, | Foxes, |
| Buzzards, | Ravens, |
| Kestrels, | Carrion and Hooded Crows, |
| and the smaller Sea-Gulls. | Great Black-backed Gull,
and Adders. |

Strict injunctions ought to be given by landowners that the birds mentioned in the first class should not be destroyed. Their presence in full numbers, though inadequate to avert an outbreak, would undoubtedly tend to mitigate it, and, as has been proved in the case of the Short-eared Owl, they have the faculty of multiplying abnormally in presence of an unusual supply of food. They are at all events most useful allies to man in combatting attacks of ground vermin.

The Committee further desire to deprecate in the strongest manner possible the use of the pole-trap for the capture of hawks. Besides the inhumanity of this device, it is indiscriminate, and harmless Owls, Kestrels, and Buzzards are just as likely to be taken by it as are the more mischievous species.

Three animals, diligent vole-destroyers, have been omitted from both these lists, because they are undoubtedly hurtful to game. The first of these is the common Rook (known to the shepherds as the "Corn Crow"), of which, however, the services to agriculture are now generally recognised.

The other two animals referred to are the Stoat and the Weasel. Of all the smaller beasts of prey these are perhaps the most hateful to gamekeepers, and it is hardly reasonable to expect that Stoats should be allowed to multiply in game-coverts, or in the vicinity of pheasant-coops. But the Committee have no hesitation in recommending that Weasels, which are persistent mouse-hunters and do little damage to game, should not be molested, at least on moorlands and hill-pastures, where they can do little harm and much good.

The Committee cannot conclude their labours without expressing gratitude for the consideration with which they were everywhere received in the course of their inquiry; for the hospitality shown to them; and for the exertions made by various individuals to obtain witnesses and arrange their evidence.

HERBERT EUSTACE MAXWELL (Chairman).

MINTO.

D'ARCY W. THOMPSON.

JOHN GILLESPIE.

WALTER ELLIOT.

J. E. HARTING (Secretary).

The printed evidence which follows the Report extends to upwards of sixty folio pages, and is succeeded by the following Appendices:—

- I. Major Craigie's Report of March, 1892, including those of the Inspectors to the Board of Agriculture.
- II. Lord Glenbervie's Account of the Devastations of Field Mice in the Forest of Dean and in the New Forest in 1813-14.
- III. Sir Walter Elliott's Account of the Plague of Field Mice on the Border Farms in 1876-77.
- IV. Foreign Correspondence, including an article by Dr. Gennadius, Director of the Department of Agriculture in Greece, on a plague of Voles in Thessaly.
- V. Statement of Rainfall in Kirkeudbrightshire, 1861-92, referred to in the evidence of Mr. Robert Service.
- VI. Reports by Professor Loeffler (1) on the results of laboratory experiments made by him on Mice and Voles with the *bacillus typhi murium*; (2) on the plague of Voles in Thessaly and its supposed counteraction by the *bacillus typhi murium*.
- VII. Account of a Plague of Field Mice observed in La Plata by Mr. W. H. Hudson.
- VIII. Memorandum by the Chairman upon a visit to Thessaly in January, 1893, for the purpose of surveying the Vole-infested district and taking evidence as to the outbreak and spread of the plague, and the results of experiments made with a view to counteract it.

In addition to these Appendices, there is a very full "Subject Index" to the evidence, and the Report is illustrated by four plates containing figures of (1) the Short-tailed Vole, and Long-tailed Field Mouse; (2) the Weasel and Stoat; (3) the Kestrel and Sparrowhawk; (4) the Short-eared Owl, and heads of old and young Rooks. At the end is a folding map of the Scottish counties affected by the plague, wherein every locality mentioned in the evidence is underlined with red-ink for convenience of reference.

OBSERVATIONS ON THE COMMON FIELD VOLE OF
THESSALY.

BY THE EDITOR.

VERY little attention seems to have been paid to the smaller mammals of Greece, if we consider how little has been published concerning them. Indeed the literature dealing with the Vertebrate fauna of that country is of the scantiest nature, and relates chiefly to the Birds, of which no very recent account has appeared.

The Greeks are not naturalists by taste or inclination, and, to judge by the present state of the Zoological Museum at Athens, there would seem to be few collectors, and still fewer modern observers, from whom any reliable information of this kind is to be obtained.

During a recent visit to Athens, and to Larissa, the capital of Eastern Thessaly, I lost no opportunity of interrogating the natives as to the birds and beasts to be met with, and was everywhere struck with the ignorance displayed on this subject, and the general indifference which prevailed respecting it.

It was not until we reached the great plain of Larissa, where a plague of Field Voles has been for some time manifest, that we encountered those who could impart some information on at least one small indigenous mammal, namely, that which was causing such mischief and pecuniary loss to the resident land-owners. That it was a Vole (*Arvicola*) of some sort was certain; but as to the precise species some difference of opinion had been expressed.

Dr. Gennadius, the Director of the Department of Agriculture in Greece, in an article entitled "Les Campagnols en Thessalie," published in the 'Journal d'Agriculture Pratique' (March 19th, 1892), wrote: "Les campagnols de la Thessalie paraissent être indigènes et appartiennent selon toute probabilité à l'espèce de Savi, *Arvicola* ou *Microtus Savii*."

When Prof. Loeffler, on the recommendation of M. Pasteur, was invited last year, by the Greek Government, to visit Thessaly for the purpose of endeavouring to combat the plague of Voles there, by inoculating them with the *bacillus typhi murium*, he was under the impression that the species might be identical with that which had some time previously devastated parts of Germany,

namely, *Arvicola arvalis*, and, as it was important to him to discover whether this was so, he telegraphed to Athens as follows:—"Before I start with my assistant, I should like to be certain that the Field Vole in question is *Arvicola arvalis*. The species is very important, as I have only established the action of the bacillus in *Arvicola arvalis*. Please enquire in Athens, and let me know."

The reply he received was as follows:—"It is *Arvicola arvalis*, called Campagnol in French."

Although this determination subsequently proved to be erroneous, the species in question appeared to be equally susceptible to the action of the virus, as did the German examples of *A. arvalis* and the Scottish examples of *A. agrestis*, upon which Prof. Loeffler experimented in his laboratory at Greifswald.

On reaching the field of his operations in Thessaly, as he tells us in his Report (*cf.* Zool. 1892, p. 314), he "perceived, at the first glance, that the Thessalian Field Vole was undoubtedly different from our *A. arvalis*. It was considerably larger, paler in colour, with large shining eyes, and a very short tail. It had a much more vigorous and rat-like appearance than our Field Vole."

M. Gennadius, at this stage of the proceedings, remarked that the scientific determination of the species was rather difficult, and that the Thessalian Field Vole exhibited several of the characters of *A. arvalis*, but that it might possibly be *A. Savii*.

It was of some interest, therefore, to settle the question, and with this object I wrote to Prof. Loeffler, to whom (with the co-operation of Mr. Robert Service, of Maxwelltown, Dumfries) I had forwarded two consignments of live Scottish Voles, *A. agrestis*, begging him to procure specimens of the Thessalian Vole, and forward them in spirits, for examination, to Mr. Oldfield Thomas, at the Natural History Museum, South Kensington. In due time specimens arrived, and upon careful examination and comparison it was found that they were referable to none of the species above named, but were identical with *A. Güntheri* of Danford and Alston, described by them in 1880 from Asia Minor.*

This unexpected result is of much interest; for it is curious that a European species, so common as to overrun and devastate large tracts of country in Eastern Thessaly, should have

* Proc. Zool. Soc. 1880, p, 50, pl. V.

remained so long unrecognised, or confounded with other European species.

Messrs. Danford and Alston, who, with some misgiving, thought it might possibly be identical with *A. leucura* of Severtzoff,* thus described it:—

“It is not with a light heart that we venture to add to the long list of described species of *Arvicola*; but two specimens of a Vole which Danford found abundantly in the marshes below Marash, present such striking characters that no choice is left to us.

“The following is a detailed description of the animal, which belongs to Blasius’s subgenus *Arvicola* proper, characterised by the first lower molar having *nine* and the second upper molar *four* cemental prisms:—

“Ears moderate, well haired towards their margin, showing distinctly above the fur. Tail hardly longer than the hind foot, and a little more than one-fifth the length of the head and body. Soles densely haired almost to the roots of the toes; fore feet with five tubercles, arranged three and two, besides the very small rudimentary thumb, which has no nail; hind feet with five tubercles closely set, and arranged two, two, and one. Teeth very similar to those of *A. arvalis*, the molar pattern being—

Upper I.—5 prisms 6 angles.	Lower I.—9 prisms 3 angles.
„ II.—4 „ 5 „	„ II.—5 „ 6 „
„ III.—6 „ 7 „	„ III.—3 „ 3 „

But the posterior prisms of the first and second upper molars are dilated behind, and that of the third is produced behind its internal projection. The first three prisms of the first lower molar are imperfectly separated.

“Upper parts yellowish mouse-grey, the tips of the hairs being either light fawn or black; on the flanks this colour passes insensibly into the greyish white of the lower parts, which is slightly washed with yellow on the belly. Feet greyish white. Tail rather thinly clad with short white hairs; these are mixed on its upper surface with dusky hairs, which are most conspicuous near the point. Measurements (in spirits):—

Length of head and body	...	4 in.	4.25 in.
„ tail82	.77
„ ear40	.42
„ hind foot75	.75

* ‘Turkestaniski Jevotnie,’ pp. 61, 82; Ann. and Mag. Nat. Hist. (4th ser.), vol. xviii. p. 53.

"This Vole differs from all others with which we are acquainted in the extreme shortness and peculiar colouring of the tail, and in the density of the hairiness of the soles. It would appear to be most nearly allied to *A. arvalis*, from which it is at once distinguishable by its proportions and by the number of plantar tubercles. In general appearance it bears a strong resemblance to *A. Stoliczkanus*, Blanford, from Yarkand; but that animal has not only a yellowish-white tail, but belongs probably to the subgenus *Paludicola*, Blasius, the first lower molar having only *seven* cemental prisms. It seems not at all improbable, on the other hand, that our animal may be identical with *A. leucura*, Swertsoff; his diagnosis is not impertinent, although he says that the tail is one-fourth the length of the body, and white with a black tip. But in any case his name cannot stand, being preoccupied by the *A. leucurus* of Gerbe, which Blasius and Fatio have united with *A. nivalis* of Martius. We therefore propose to name our species in honour of our friend Dr. Günther."

Thus far Messrs. Danford and Alston. They say nothing about the haunts, habits, or food of the animal, leaving it to be inferred that these do not materially differ from what has been observed of better-known European species.

Under these circumstances it seems desirable to place on record such observations as I was enabled to make concerning its habits in Thessaly, premising that the season of the year at which I was in the country—namely, during the month of January—was by no means favorable for such observations. Unusually severe weather prevailed, and before the end of the month the great plain of Larissa was covered with snow. Innumerable burrows were to be seen in the fields and along the railway embankment between Velestino and Larissa, but the Voles were all under ground.

It was observable that the Thessalian Voles, except when feeding, dwell less upon the surface of the land than do their Scottish congeners. The "runs" or "galleries" of the latter may be seen in all directions on ground which is infested by them, and an ordinary walking-stick will suffice to dislodge the occupants. The burrows of the former, on the contrary, are more perpendicular than horizontal, and extend very often to such a depth that the extremity of a burrow can only be reached with the aid of a spade. For this reason it is comparatively easy to apply a remedy in Greece which would fail in Scotland, namely, the injection into the burrows of bisulphide of carbon,

causing asphyxiation of the inmates. Moreover, the application of such a remedy would be much easier in the level plains of Thessaly, where the openings of the burrows are everywhere perceptible, than on the rough hill pastures of Scotland, where such openings would have to be carefully looked for, and where in ordinary runs the former would be dissipated long before the animals could be affected.

The burrows of the Thessalian Vole, which are about two inches in diameter, and go to a depth of from eight inches to a foot or more, lead to a gallery which widens out towards a depression in which a nest of dry grass is formed. Several vertical holes sometimes lead to the same gallery, thus facilitating escape in case of need. If water were poured down one hole, the inmates would bolt from another. If the fumes of bisulphide of carbon were to be injected by one hole, those in the immediate neighbourhood would have to be previously stopped. Between the holes well-trodden runs may be perceived, but of nothing like the length of those made by *A. agrestis*.

Another peculiarity remarked was, that the Thessalian Vole is more nocturnal in its habits than our well-known British species. It is rarely seen out in the daytime, and the food which is collected at dusk is dragged into the holes and devoured there at leisure.

Like *A. agrestis*, it multiplies at an extraordinary rate. The period of gestation was not precisely ascertained, but is believed to be about twenty-four days, and the female will produce three or four litters during the spring and early summer, each litter containing from six or eight to a dozen young ones.

As to the nature of the ground which these Voles infest, the great treeless plain of Larissa in the east, like that of Trikala in the west, formerly the bed of an inland sea, is now a great wheat-producing district, the particular wheat grown there being much esteemed for the manufacture of maccaroni, and large quantities of it are exported from Volo to Naples, Genoa, and Marseilles. The soil, though heavy, is in many places loamy, and its fertility is doubtless increased by the inundation, during the winter months, of the River Peneios. The land in this extensive plain is in the hands of comparatively few proprietors, each of whom owns many thousands of acres. The peasants who farm under them take a share of the crops in return for their labour. But

owing to the scanty population it is impossible to find labour sufficient for the entire cultivation of the district, and considerable areas lie fallow for three years, being used in the meantime for pasturing cattle. This, then, is the nature of the ground infested by the Thessalian Field Vole.

The natives, though fully aware of its destructive habits, are very apathetic in regard to remedial measures, and, were it not for the more enlightened views of their employers, they would leave things to take their course, without any interference save sprinkling the ground with holy water from Mecca, in the hope of thus securing the direct intervention of Providence.

The real enemies of these little animals are the Kestrels, Buzzards, Kites, and Harriers, of which we saw great numbers in the plain. To convey some idea of the frequency with which these birds were observed, I give the following list of species observed one day *in the course of an hour*, named in the order in which they were seen, and noted immediately in my pocket-book:—Rooks, Magpies, Crested Larks, Starlings, Calandra Larks, a Great Bustard, two Magpies, a Common Buzzard, two Kites on the wing at close quarters, six Buzzards and a Kite on the wing together; two Kites on a small tree, about fifty yards distant; two Magpies, several Rooks, a solitary Kite, a small flock of Stock Doves passing over, a Kestrel, a flock of Crested Larks; five Snipe, rising from a pool near the railway line; one Kestrel, a flock of Linnets, Wild Ducks on a pool; an Eagle seen at a distance, species uncertain; a Kite on the wing at close quarters, two Magpies, a flock of Larks, two Kestrels, a Kite, another Magpie, another, another, and a flock of Peewits.

In the absence of trees, the Kites and Buzzards were frequently seen perched upon the telegraph-poles, upon which they would often remain unconcerned until we were within twenty yards of them. On one occasion a Rough-legged Buzzard allowed so near an approach that, when at last it took flight, we were near enough to see the feathered legs, which dropped for a few seconds until the bird was fairly on the wing. The Harriers seen were the Marsh Harrier and a blue one—apparently *Circus cyaneus* (Linn.), which is most likely only a winter visitant to Thessaly.

This host of rapacious birds (amongst which, to our surprise, we saw no Short-eared Owls) would make tremendous havoc amongst the Voles; and perhaps the reason for the nocturnal

habits of the latter is that their chief enemies are diurnal birds of prey, and that during the winter months there is comparatively little covert to screen them from observation. They have probably gained wisdom from experience.

In conclusion, and in reply to a question which has been frequently asked, I may add a few words as to the origin of the name *Vole*. This name does not appear to be of any antiquity. Low, in his 'Fauna Orcadensis,' published at Edinburgh in 1813, gives it as in use in Orkney. From this source probably it was adopted by Fleming, in his 'History of British Animals,' 1828, and, following him, by Macgillivray, in his 'British Quadrupeds,' forming vol. vii. of Jardine's "Naturalists' Library." At p. 260 of that volume, under the head of Water Vole, Macgillivray writes:—"The generic name *Vole*, applied to the *Arvicolæ* by Dr. Fleming, seems to be preferable to *Campagnol*, because, although it has no meaning, it gives no erroneous idea of these animals, whereas the latter, besides being descriptively inaccurate, is merely a French word awkwardly introduced, with a pronunciation quite un-English."

As to the meaning of the word, whether it was originally derived from the French or not, I cannot say. The French verb *voler*, has two significations, according to the context in which it is employed, namely, "to steal" and "to fly," or, as we may say, to dart rapidly; either or both of which terms would be applicable to every species of the genus *Arvicola*. If, however, the use of the word has come to us through the Orcadians, its origin is probably to be sought for in Scandinavia.

NOTES AND QUERIES.

The Ornithology of Tennyson.—Under this heading the Rev. J. G. Tuck has an article in the February number of 'The Naturalist,' in which numerous extracts are given from the laureate's poems, presumably intended to show his apt allusions to the feathered race. Picturesque enough are these allusions, no doubt, and poetical, but too often, alas! inaccurate. The expressions in many cases which are intended to be descriptive of notes and flights are neither the best which could be employed, nor are they sometimes sufficiently correct to satisfy the critical ornithologist. In my opinion they tend to prove that the laureate had neither a good eye for

colour nor a good ear for bird-music, while occasionally want of close observation has led to his attributing to certain birds habits which they do not possess. Witness the line in 'The Poet's Song,' where

"The swallow stopt as he hunted the bee,"

and the allusion in 'In Memoriam,' to

"The distant sea where now the sea-mew pipes or dives"

—attributes which are not possessed by any species of sea-gull. On the other hand, it must be allowed that there are several allusions to birds to which no exception can be taken. Such, for example, as the lines in 'The May Queen'—

"The building rook will caw from the windy tall elm tree,
And the tufted plover pipe along the fallow lea."

Here the term "pipe" is strictly appropriate. Again, in 'The Gardener's Daughter,' the Blackbird's song is poetically alluded to the line—

"The mellow ouzel fluted in the elm."

But a few such happy expressions as these do not of themselves entitle the departed laureate to be regarded as more than an ordinary lover of birds, while as an ornithologist, in the proper sense of the term, he shows himself, in my humble judgment, inferior to many English poets who have preceded him.—J. E. HARTING.

MAMMALIA.

Animals poisoned by Yew.—Sometimes, in connection with reported cases of yew poisoning, attempts are made to explain the apparently uncertain action of the poison upon animals, by suggesting that the effect depends upon the sex of the tree upon which the animal has browsed. We have many yews here, and I can remember at least five cases of evident yew poisoning, including sheep (about twenty), horses, and a donkey. At this moment the sex of the tree is easily to be distinguished, as the pollen from the male trees flies in clouds at the slightest touch. I have just been to examine a tree which caused the death of a keeper's pony some years ago, which was tied to the stem for a few minutes, and at whose *post mortem* I was present. The tree—a detached one, and of considerable age—is a male.—W. H. ST. QUINTIN (Scampston Hall, Rillington, York).

The Black Rat in Portugal.—Although nearly extinct in this country, *Mus rattus* is still fairly plentiful elsewhere. In Oporto, for example, I have seen many trapped both in dwelling houses and in wine stores. The Portuguese workmen call them "padres" (or priests). Their fur is much longer and finer than that of the Brown Rat, *Mus decumanus*, which in Portugal is by far the commoner of the two.—C. S. GORDON (Glencairn, The Ridgeway, Willesden).

The Deer Forests Commission.—In the House of Commons on March 16th, Mr. Weir asked the Secretary for Scotland whether it is intended to give crofters, cottars, and others opportunities for submitting statements and giving evidence before the Deer Forests Commission with respect to grievances occasioned by deer forests, grouse preserves, and sheep runs; and whether the Commissioners will make arrangements to give due notice of their intended visit to the districts concerned. Sir G. Trevelyan said: The Commission have instructions to inquire whether any, and, if any, what land in the crofter counties, now occupied for deer forests or for other sporting purposes, or for grazing on a large scale, is capable of being profitably utilised by crofters or other small tenants. Naturally they will receive evidence from all competent sources, whether crofter or landlord, which bears on the subject. The Commissioners will give due notice of their visit to any district.

BIRDS.

Purple Gallinules in Norfolk and Sussex.—With reference to the two occurrences of Purple Gallinule (? species), recorded by Mr. J. Whitaker (Zool. p. 105), it is perhaps well that I should mention that two healthy specimens of the Green-backed Purple Gallinule, *Porphyrio smaragdonotus*, escaped hence, either towards the end of 1890 or early in 1891. I have, within the last few days, heard that a "Purple Waterhen" was observed several times in a garden near Peterborough during the severe weather of 1891-92, and am naturally disposed to think that it was, in all probability, one of my escaped birds. I may add that, in some forty years' experience of collecting living birds, very few of the European Purple Gallinule, *P. cæruleus*, have ever been offered to me for sale, whilst, on the other hand, I have very frequent offers of *P. smaragdonotus*, of which species many are annually shipped for Antwerp from Egypt; and *P. melanotus* of Australia, *P. poliocephalus* and *R. calvus* of Asia, and *P. madagascariensis* of Africa, are not uncommonly to be found in the hands of dealers in live birds in this country and on the Continent.—LILFORD (Lilford Hall, Oundle).

The Purple Gallinules in Norfolk and Sussex.—Without wishing in any way to discredit the likelihood of the Purple Gallinules mentioned as having been killed in Norfolk and Sussex being purely wild birds, it may be interesting to readers of 'The Zoologist' to know that prior to 1881 some fourteen or fifteen examples of both the Blue-backed and Green-backed species went away, at different times, from a wired-in piece of water at our home in Kent. About thirteen acres were wired-in, and they had abundance of covert and a running stream; but they were the very worst birds possible to keep at home, climbing over anything, and always keeping out of sight; they were pinioned, or rather had the wing-feathers cut, and

on moulting would of course have recovered their power of flight. They are, I fancy, very long-lived birds, as all water-fowl are. An old female Pochard I am acquainted with reared a brood regularly for seventeen years.—
E. J. B. MEADE-WALDO (Rope Hill, Lymington, Hants).

Ring Ouzel in Norfolk in Winter.—On the 26th of February, Mr. A. J. Napier, of Holkham, informed me that he had seen a Ring Ouzel on the 22nd, frequenting the meadow on the Wells and Holkham Road; that it flew across the road, and alighted on the hedge close to him; and that on the 26th he had seen the bird in the meadow, close to my house. I went out before breakfast on the 27th of February, with my gun, and found the Ring Ouzel in the meadow within a hundred yards of my study window; the bird allowed me to come within twenty yards, so that there was no necessity for shooting it for identification. It was feeding on the grass along with several Starlings. My cows are turned out on this marsh, and no doubt there are plenty of worms to be found under their droppings, which seemed to have an attraction for the bird, as it was hopping about precisely in the manner of a Blackbird. I may say that, brought up in Lancashire, with the moors and Ring Ouzels close by, I could not be mistaken in the species. The occurrence of this bird in England in the winter time, and indeed before April, is very remarkable.—H. W. FEILDEN.

[The occurrence of the Ring Ouzel in England in winter has been several times noticed in the pages of this Journal. See 'Zoologist,' 1879, pp. 174, 203, 266. See also Mansel Pleydell, 'Birds of Dorsetshire' (p. 22), and Bull, 'Birds of Herefordshire' (p. 9). The Rev. C. L. Eagles writes that "the Ring Ouzel lives all the year round on the slopes of the Black Mountains" (Herefordshire), and adds, "I have shot them in winter, and have often found their nests in summer." It was a consideration of the many reported instances of the occurrence of this bird here in winter that induced us, in the 'Handbook of British Birds' (p. 12), to characterise it as a "resident" rather than a "summer visitor," though we added the remark from personal observation that "in the eastern and south-eastern counties of England it is a spring and autumn migrant."—ED.]

Waxwing in Caithness.—We continue to hear at intervals of the appearance of Waxwings in different parts of the country, although not in such numbers as appear here in some winters. In 'John O'Groat's Journal' for Feb. 21st it is reported that Mr. John Malcolm, sheriff's officer at Wick, captured, during the previous week, one of these birds near Rosebank.—ED.

Waxwings in Suffolk.—From fifteen to twenty Waxwings have been shot in Suffolk this winter. In addition to five recorded in 'The Field,' Mr. Travis, of Bury, has had six, of which five were sent in together from

Stowlangtoft, about the 1st of March, and Mr. Bunn, of Lowestoft, had one which was shot on Feb. 25th. Three were recorded in a local paper as shot by a warrener at Hollesley about the end of January, and I have heard of one or two more. Such an immigration has not occurred since the winter of 1866-67.—JULIAN G. TUCK (Tostock Rectory, Bury St. Edmunds).

Waxwings in Essex.—On Feb. 23rd a Waxwing, *Ampelis garrulus*, was shot here, whilst feeding on privet berries. It was either very fearless or stupid, for it allowed several persons to place their hands within a few inches of it. On dissection it proved to be a female bird, and it has five wax-like appendages on each wing. On March 4th, another was killed by a boy with a stone. This was a male, and is the finest bird of four killed in this neighbourhood, the wax-like appendages being larger than any of the others, and numbering six in the right wing, and five in the left. The Waxwings killed on Jan. 30th near here (as already reported, p. 109) were male and female, and had four wax tips in each wing.—F. KERRY (Harwich).

Waxwing and Firecrest in Sussex.—We had sent us for preservation on March 2nd a Waxwing *Ampelis garrulus*, which had been killed at Steyning a few days before; it is a dull-coloured hen bird. On March 18th a female Firecrest, *Regulus ignicapillus*, was brought in for preservation; it had been killed in the furze on the Downs near here.—BRAZENER BROS. (Brighton).

[How about the close time? It is illegal to shoot these birds between March 1st and August 1st.—ED.]

Zonotrichia albicollis, Bonap., in Holderness.—At the commencement of the year Mr. G. W. Jalland, of Holderness House, near Hull, saw, amongst the birds he was in the habit of feeding on his lawn, one with which he was not acquainted, and which he thought might be a wanderer from some distant part of the world. The bird remained about the grounds for six weeks, and its identity not having been solved by Mr. Jalland (though a practical out-door ornithologist), it was shot on Feb. 13th, and sent in the flesh to Mr. Philip Loten, of Easington. I was indebted to Mr. Hewetson, of Leeds, for a full description of the stranger, and an excellent and accurate water-colour sketch of it, on seeing which I suspected it would prove to be an example of the White-throated Bunting, *Zonotrichia albicollis*, and probably an adult male in winter plumage. Subsequently, on Feb. 25th, I had an opportunity of examining it at Mr. Loten's house in Easington, and verifying my supposition. The water-colour drawing was also sent to Prof. Newton for his inspection, who agrees in the determination as *Z. albicollis*. The White-throated Bunting has occurred twice previously in Great Britain,—once on the coast near Aberdeen, in August, 1867, and again at Brighton. The illustration given in Gray's 'Birds of the West of Scotland' gives a very poor idea of the beauty of this bird,

which is a true Bunting, and in no way deserving the trivial name of "Sparrow," which the Americans apply to so many of their finches and buntings. There is not the slightest trace of its ever having been in confinement, either in feather or feet, in this Holderness example, which was undoubtedly a wild bird. The following is its description :—There are two almost black stripes on the crown, separated by a median one of pale buff or dirty white; a broad superciliary stripe from the base of the mandible to the occiput, yellow as far as the middle of the eye, and then pale buff; a broad dark patch on side of head enclosed between darker lines, one of these running through region of eye, the other forming the rictal streak; throat a smoky silky white, and sharply defined against the bluish grey of sides of head and breast—this is margined with a narrow black maxillary line. Edge of wing and axillaries a bright yellow; the whole of the breast and flanks are marked with indistinct and very fine horizontal lines, visible only in certain lights. Back and scapularies rufous-brown, with darker streaks. Wings comparatively short, and extending little beyond root of tail; tail rather long and only slightly rounded, a dark olive-brown; two narrow white bands across wing-coverts. Legs and edges of mandibles flesh-coloured. Length, 7 inches.—JOHN CORDEAUX (Eaton Hall, Retford).

Reported occurrence of the Two-barred Crossbill and Scarlet Grosbeak in Norfolk.—In the 'Zoologist,' 1892 (p. 400), a Two-barred Crossbill is recorded to have been obtained at Yarmouth; but it turns out to be only a very streaky young Common Crossbill, with faint buff tips on its wing-coverts, such as led Brehm to institute his *Crucirostra rubrifasciata*. At p. 401 a Scarlet Grosbeak, *Pyrrhula erythrina* (Pallas) is mentioned with some hesitation, as I had not then seen it. It is a female, and was caught on the denes, between Yarmouth and Caistor, by a local bird-catcher named Jessup. It moulted all its feathers in October; and on November 16th, though still rather ragged, agreed with a skin from Asia, except that it had lost all its dark striations. When first caught, Mr. W. Lowne—to whom the bird belongs—described it to Mr. Southwell as having a streaked breast, and a greenish tinge which it lost at the moult. It has done very well since, and grown tame on soft food and gentles. The eye on Jan. 24th was dark brown, the legs and beak horn-colour, and the general tone of the plumage very like that of a hen House Sparrow.—J. H. GURNEY (Keswick, Norwich).

Rare Birds in Lancashire.—Knowing the county, I have read with great interest your remarks on Mr. Saunders' new edition of Mitchell's 'Birds of Lancashire.' With regard to the Sociable Plover, it seems only just to the author that a brief explanation should be offered as to how he acquiesced in the identification of the bird in question as a Courser. The fact is, Mr. Mitchell had known the bird for years as a reputed Cream-

coloured Courser before he ever set eyes on it. When he did obtain a hasty glance at it, he only saw it by the light of a single candle, and it was partly hidden by other birds preserved in the same case, so that he had no chance of identifying it. Of course, when the bird was taken out of the case it was easily identified. I may add, in reference to the Frigate Petrel, the remark that, although we have no proof that the bird ever saw the shores of Britain, yet there can be no doubt that it must have wandered to our coast, for the reason that, when washed ashore on Walney, it was fresh enough to make a very fair skin. The Wilson's Petrel, obtained at the same time, was much more decomposed when found.—H. A. MACPHERSON (Carlisle).

The Antarctic Sheathbill on the Coast of Ireland.—In the 'Zoologist' for January last (p. 28) Mr. Barrington reported that a bird of this species, *Chionis alba*, was shot by the keeper at Carlingford Lighthouse, Co. Down, on December 2nd, 1892, and was forwarded for his inspection. At a meeting of the Zoological Society, on February 28th last, the bird was exhibited on Mr. Barrington's behalf by the Secretary, and naturally attracted considerable attention from ornithologists present. As *Chionis alba* is known to occur only in the Falkland Islands and South Georgia, the appearance of a living example on the coast of Ireland is only to be explained on the assumption of man's intervention. In all probability the bird was being brought home alive on some homeward-bound vessel from the Falklands, and, having fluttered overboard, succeeded temporarily in making its escape.—ED.

Nesting of the Black Scoter in Sussex.—In the 'Zoologist' for 1892 (pp. 151, 228) we published two letters from Mr. Charles Fowler and Mr. Anderson (the Curator of the Chichester Museum), on the subject of the alleged breeding of *Ædemia nigra* in Earnley Marshes, near Chichester. The statement was so extraordinary in view of what is known of the usual nesting-haunts of this species, that we hesitated to accept it without very positive evidence. Mr. Fowler having seen a brood of seven which could just fly, and shot the male bird in August, 1891, forwarded the latter to Mr. Anderson, who vouched for its being correctly named. This bird, which was preserved, was lately forwarded to London for the inspection of ornithologists, and was exhibited by Mr. Howard Saunders at a meeting of the British Ornithologists' Club on the 26th of January last. Evidently the bird in question was a Scoter; but we must confess that we would rather have seen one of the young brood referred to. The question of breeding would then have been more satisfactorily settled. It is so common an occurrence for non-breeding species to be seen swimming about on the same pool with others which are nesting in the neighbourhood, that this missing link in the evidence is the more desirable.—ED.

Petrels seen on the Voyage to Montevideo.—I forward a note of the Petrels seen by me during the voyage out to the River Plate. I have no books to refer to here, and a visit to the Museum at Buenos Ayres (where there is a good and well-arranged collection of birds) did not help me much, so I should be very glad to have the identity of some of the species determined if possible. Sept. 4.—Entered Bay of Biscay at 4 a.m.; a dozen Storm Petrels following us all the forenoon. Sept. 5.—Bowling along merrily before the Portuguese trade-wind; off Cape Finisterre about noon. Among the Petrels was a Fork-tailed one. Some brown Shearwaters, *Puffinus kuhli*. Sept. 6.—38° 48' N., 12° 29' W.; at noon. At least a hundred Storm Petrels followed all day. A small Shearwater, nearly black, top of head quite so, and under parts pure white; very swift flight (? *P. obscurus*). Sept. 7.—At noon; 34° 43' N., 15° W. Some Storm Petrels seen, but fewer than on previous day. Sept. 13.—At noon; 14° 47' N., 26° 14' W. In the morning, when about 80 miles south by a little west of Brava, one of the Cape St. Verde group, saw several times a small black Shearwater with pure white under parts. Sept. 18.—At noon; 5° 33' S., 32° 10' W. An Albatross, *Diomedea melanophrys*, I think, came round the ship in afternoon. When at the quarantine station in Albrahao Bay, Ilha Grande 24th and 25th Sept., I saw two or three Frigate Birds, and there was always a little flock of them over the fish-market during the two days we were at Rio de Janeiro. Sept. 28.—At noon; 23° 37' S., 43° 47' W. Four Wilson's Petrels were following us in the afternoon. Sept. 30.—At noon; 30° 51' S., 49° 5' W. Off the coast of Rio Grande, in the seas of the Petrels. Two Cape Pigeons *Daption capensis*, and a great many dark sooty-brown Shearwaters, considerably larger than Cape Pigeons (? *P. fuliginosus*). There was another species, intermediate in size, brown, with under parts below the chest white, and another rather larger than the sooty-brown ones; wings and small saddle-patch black; rest of plumage white. Several Wilson's Petrels, and one about the size of the last named, but with belly white. What could this have been? Some Albatrosses, *D. melanophrys*? on the wing, and resting on the sea. Altogether a wonderful collection. Oct. 1.—At noon; 34° 12' S., 52° 54' W. Off the coast of the Banda Oriental, and in sight of land in the afternoon. Cape Pigeons were seen in the morning. The big Sooty Petrels (or Shearwaters) followed us all the afternoon, and not far from land, which we were able to approach closely in consequence of the weather being very fine and clear.—O. V. APLIN (Estancia Santa Elena, Monzon, Dept. de Soriano-Uruguay, Feb. 9).

Ruddy Sheldrake in Norfolk.—Col. Feilden informs me that the supposed Ruddy Shelducks at Holkham (Zool. 1892, p. 395) were certainly some other birds. There is no doubt, however, about the Snettisham Ruddy Shelduck, which shows two incipient black tips where the collar

ought to be. It is now in my collection. The threadbare tertials referred to (p. 397) are no indication of confinement, for I have seen them in a wild Ruddy Shelduck in Egypt: but they are scarcely apparent in the Norfolk bird.—J. H. GURNEY (Keswick, Norwich).

Lapwings passing over London.—As one does not have many opportunities of studying wild birds in London, it may be worth recording that at midday, on March 4th, a flock of about a dozen Lapwings passed over Jermyn Street and Piccadilly, flying northward.—CLEMENT REID.

The Gadwall in Scotland.—As the Gadwall, *Anas strepera*, is a somewhat rare bird in the north-east of Scotland, it may perhaps be of interest to record that in December, 1892, I purchased a drake of this species, which had been shot a few days earlier, by a man named James Robertson, in the neighbourhood of the Moray Firth.—H. A. MACPHERSON (Carlisle).

The Nutcracker in Lincolnshire.—Lincolnshire, in common with many other counties, has no record of a Nutcracker, *Nucifraga caryocatactes*, taken within its borders. Assuming that all the *bonâ fide* British specimens of this bird had hitherto been carefully recorded, I wondered how one came to be in a certain public-house in Lincoln. In the course of four or five years I paid several visits to this inn, to see the additions made to his collection by the proprietor. Doubtful whether the Nutcracker was a county specimen, yet wishing to secure it, I offered a case in exchange for it, and the bird became mine. On examination I could find no inscriptions about the case, it having the usual old-fashioned covering of paper, the edges of which, pasted wide over the glass front, acted as moulding, and that detached in places had let in the dust of half a century. So I unglazed the case, and, on removing the bird preparatory to throwing the box away, the inscription, "Male, killed near Sleaford, Linc.," written close inside the case, attracted my attention, and on the corresponding side, too, was marked "March, 1833." So far, so good; but who was the writer of the inscription? Thinking I might find more information outside the case if I removed the colouring of glue and lamp-black, I cleaned the paper, only to find an old report of a parliamentary division. Col. Mason, calling the same day, inspected the case and the data, and, after carefully comparing the handwriting with that of Lucius Gray on some cases in his own collection, he had no doubt that it was identical. And who was Lucius Gray? On the same authority, I learn that he was the taxidermist of Sleaford who preserved most of the so-called "rare birds," at a time when Lincolnshire was described as "The Aviary of England." Many of his birds—from the late Dr. Harvey's collection—were transferred to the old British Museum. It is to be hoped a full list of them will appear when Mr. Cordeaux's 'Birds of Lincolnshire' reaches a second edition.—A. FIELDSEND (Lincoln).

Hybrid Birds at the Crystal Palace Show.—Some correspondence on the subject of the Blackbird and Thrush hybrid, exhibited at the late Crystal Palace Show, has elicited the information that it was taken early in June, 1892, a few miles from Northampton. The nest in which it was found contained three young birds, of which the remaining two died a few days after their capture. A Thrush which flew off the nest is believed to have been the mother of the brood. I was unable to see the bird exhibited as a Chaffinch and Canary mule (p. 104), and would like to know the opinion of anybody who has had the opportunity of examining it, for I am not aware of any authenticated instance of such a hybrid, and some enquiries made into the history of the specimen in question have led to no satisfactory result. — A. HOLTE MACPHERSON (51, Gloucester Place, Hyde Park).

Preservation of New Zealand Native Birds.—It is exceedingly satisfactory to learn that steps have been taken by the authorities of New Zealand to preserve from total extinction the native birds, which are being destroyed in many parts of the colony by the spread of population and by the destructive animals, such as pigs, cats, and other Carnivora introduced by the Europeans. The most obvious method of securing their preservation is the devotion of one of the numerous islands, situated on the coast, to their exclusive use. With a view to carry out this arrangement, Mr. Henry Wright, of Wellington, visited, at the request of the Hon. Mr. Seddon, the island now known as the Little Barrier, or, as it was formerly called, Hauturu Island, situated to the west of New Zealand in 36° south latitude. This island is almost circular, being four and a half miles north to south, and three and a half east to west, rising in the centre to over 2000 ft.; parts of it are extremely rugged, and others comparatively flat and fit for human habitation. The precipitous parts of the country are covered with dense bush and undergrowth, and there are numerous creeks running into the interior, so that a sufficiently diversified country exists for the preservation of the different kinds of birds. At present, the island, which is the property of a New Zealand chief named Tenetahi, is being deprived of its valuable Kauri pines, which are being felled and sold for timber. This, it is hoped, will be put a stop to immediately on the sale of the island to the Government, otherwise all the accessible trees will soon be exhausted. The island is particularly adapted for the preservation of the birds. Mr. Wright says:—"Writing with a thorough knowledge of all the North Island, especially north of Auckland, where I formerly lived, I am able to say there is no other part of it where native birds are to be found in anything like such profusion or variety. Buller's Apteryx or Kiwi is still there, although the young birds are being destroyed by the cats, which are, unfortunately, numerous." These should be kept down, Mr. Wright thinks, by offering a reward of 9d. or 1s. a tail for their destruction. The wild pigs, which

nearly destroyed the Ohi, or Mutton-bird, have been exterminated, and there are no Weka Rails to destroy the ground-birds' eggs. Mr. Wright makes a statement with regard to the presence of bees which appears difficult to understand. He says:—"In Hauturu there are no bees, and the natives assert that Hauturu is the only island in the Hauraki Gulf with large timber where the native birds still exist in great numbers, and that this is owing to the absence of bees, which do not fly so far across the water, and which they have not permitted to be introduced. They instance the Great Barrier and other islands, equally suitable for birds, whence they have almost disappeared since the bees came." In what manner the bees cause the disappearance of the birds is not evident, but doubtless there is a reason for the statement made by Mr. Wright and the natives. The advantages of Hauturu over Resolution Island, which was proposed for the reception and preservation of the native birds, are stated by Mr. Wright to be its greater distance from the mainland, so that birds of short flight could not migrate; its mountains, which give a considerable range of climate, forming a favourable habitat for birds from the southern parts of the colony; and its size, which would enable a resident to efficiently supervise and protect it from intruders. It has also the recommendation of possessing no boat harbour, the whole island being encircled by dangerous boulder beaches, and only having a safe landing-place on the southern end. He thinks, also, that Hauturu would be admirably adapted for the experimental acclimatisation of profitable trees, such as the orange, tea, coffee, cinchona, &c. At present the island is magnificently timbered, the soil is fertile, and he looks forward to the time when the beauty of its scenery will cause it to be the show place in the North Island, where the last of the native birds and specimens of the noble Kauri pine, native palms, and ferns will flourish in their loveliness, when the primeval forest will have long since been cleared away from the mainland.—*The Field*.

SCIENTIFIC SOCIETIES.

LINNEAN SOCIETY OF LONDON.

March 2, 1893.—Prof. STEWART, President, in the chair.

Messrs. W. Ridewood, L. Ough, K. R. Kirtikar, and Rev. J. Lamont were elected Fellows.

Mr. Miller Christy exhibited some photographs of the American Bison, taken from living wild animals, and gave some account of the present restricted distribution of the species. Mr. A. G. Renshaw and Mr. W. Carruthers detailed what they had been able to learn respecting it while travelling in its former haunts.

Mr. J. M. Macoun gave an account of the flora of the Behring's Sea Islands from personal exploration.

On behalf of Mr. H. N. Ridley, the Secretary read a paper on the flora of the eastern coast of the Malay Archipelago.

March 16.—Prof. STEWART, President, in the chair.

The Rev. J. Bufton, Messrs. R. T. Baker, J. Taylor, and W. H. Wilkinson were elected Fellows; Mr. F. W. Moore was elected an Associate; Mr. W. G. Ridewood was admitted.

A curious Freshwater Alga, growing in a perfectly spherical mass, without any visible point of attachment, and described as an ægagropilous condition of *Cladophora*, was exhibited by Mr. A. W. Bennett, who stated that specimens had been found in English and Welsh lakes, as well as in Sweden, and that the peculiar spherical form of growth was difficult to explain. Mr. G. R. Murray suggested that it might be due to the action of a current which would cause a continuous revolution of the mass.

Mr. R. I. Pocock exhibited a singular nest, so called, of a Myriopod received from Sierra Leone, and formed of a clayey earth which had become hardened by exposure. It was suggested that it was not a nest in the proper sense of the word, formed by the creature itself, but rather a case fashioned by ants for the purpose of entombing their enemy.

Mr. G. F. Scott-Elliott gave an interesting account of the botanical results of the Sierra Leone Boundary Commission, and of the collections made by him during five months' travelling. His remarks were criticised by Messrs. J. G. Baker, C. B. Clarke, W. Carruthers, and Dr. Stapf (who was present as a visitor).

Mr. J. H. Vanstone described some points in the anatomy of a mollusc (*Melongena*), from recent dissections made by him, and exhibited several preparations in support of his statements. Prof. G. B. Howes bore testimony to the originality and value of the observations, which in some respects were at variance with the views of the most recent writers on the subject. Messrs. G. R. Murray and Horace Monckton offered some remarks on the similarity, in certain respects, of the fauna and flora of the west coast of Africa and the east coast of South America, with reference to the statements made by Mr. Pocock and Mr. Scott Elliott.

ZOOLOGICAL SOCIETY OF LONDON.

February 28, 1893.—Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the chair.

Mr. A. D. Michael exhibited some specimens of the *Ixodes*, known locally in the West Indies as the "St. Kitts" or "Gold Tick," received from Mr. C. A. Barber of the Agricultural Department, Antigua.

A communication was read from M. A. Milne-Edwards, respecting *Lemur nigerrimus*, Sclater, a species originally described from an example living in the Society's Gardens. It was pointed out that *Prosimia rufipes* of Gray had been based on a female of this species.

Mr. Howard Saunders exhibited and made remarks on a specimen of the American Stint, *Tringa minutilla*, shot at Northam Burrows, North Devon, by Mr. W. Broughton Hawley in August, 1892 (Zool. 1892, p. 411).

Mr. Sclater (on behalf of Mr. R. M. Barrington) exhibited a specimen of the Antarctic Sheathbill, *Chionis alba*, killed at the Carlingford Lighthouse, Co. Down, Ireland, in December last (Zool. 1893, p. 28).

Dr. C. J. Forsyth-Major read a memoir on some of the Miocene Squirrels, and added remarks on the dentition and classification of the Sciuridæ in general. The author proposed a new division of this family into three subfamilies—Sciurinæ, Pteromyinæ, and Nannosciurinæ. The genera *Spermophilus* and *Arctomys* and the allied forms were united to the Sciurinæ. The last part of the paper dealt with the primitive type of the Sciurine molar.

Mr. Henry O. Forbes read a paper entitled "Observations on the Development of the Rostrum in the Cetacean Genus *Mesoplodon*, with remarks on some of the Species." Mr. Forbes showed that in this genus the vomerine canal in the young animal is filled with cartilage, and in the adult with a dense petrosal mesorostral bone. From the examination of thirteen specimens of *Mesoplodon grayi* and four of *M. layardi*, of which he had made a large number of sections in various stages of growth, the author concluded that the mesorostral bone was not, as had been generally believed, an ossification of the cartilage, but an actual growth of the vomer and of the premaxillaries, with perhaps, in some cases, additions from the ossification of the cartilage of the vomerine spout. The cause of the growth in the vomer might be accounted for by the pressure communicated to it by the growth of the premaxillaries, induced perhaps by the movement, which appears to take place, of the maxillaries over the premaxillaries.

March 14.—Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the chair.

The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February, 1893, and called attention to two Terrapins procured in Okinawa Shima or Great Loochoo Island by Mr. P. A. Holst, and kindly presented by that gentleman. Mr. Boulenger had determined these Tortoises to be Spengler's Terrapin, *Nicoria spengleri*.

Mr. O. Thomas exhibited and made remarks on a rare Antelope, *Nanotragus livingstonianus*, from Northern Zululand.

Dr. Forsyth-Major exhibited and made remarks on a tooth of *Orycteropus* from the Upper Miocene of Maragha, Persia, which he referred to *O. gaudryi*, of the Upper Miocene of Samos. Drawings of the remains of the latter were exhibited, as well as a photograph of a femur of a Struthious bird from the same deposit in Samos. The habitats of *Struthio* and *Orycteropus* were thus shown to have been essentially identical in past times, as in the present. Therefore the general conclusions to be drawn from their geographical distribution would apply equally to both.

Mr. Oldfield Thomas made some suggestions for the more definite use of the word "type" and its compounds, as denoting specimens of a greater or less degree of authenticity.

Mr. P. L. Selater pointed out the characters of a new African Monkey of the genus *Cercopithecus*; and took the opportunity of giving a list of the species of this genus known to him, altogether thirty-one in number, together with remarks on their exact localities.

Prof. F. Jeffrey Bell read a paper on *Odontaster* and the allied and synonymous genera of the Asteroidea.

Mr. A. Michael read a paper upon a new species (and genus) of *Acarus* found in Cornwall. The creature in question, which it was proposed to call *Lentungula algivorans*, was found in some numbers on a green alga, *Cladophora fracta*, near the Land's End. It was a minute creature belonging to the family Tyroglyphidæ, the remarkable feature about it being that, whereas the two hind pairs of legs were terminated by a hard and powerful single claw (which claw sprang from the end of the tarsus), the two front pairs had the tarsus itself hardened, and curved strongly downward, forming clinging- and walking-organs; while from the side of the tarsus sprang a long peduncle, flexible in all directions at the will of the creature, and bearing an exceedingly minute claw. This apparatus was not used in climbing, but had become wholly tactile. Such an arrangement was previously unknown in the Acarina.

Prof. Howes described some abnormal vertebræ of certain Ranidæ (*Rana catesbiana*, *R. esculenta*, and *R. macrodon*), in which the so-called "atlas" possessed transverse processes and trans-atlantal nerves. Prof. Howes discussed the bearings of these specimens on the morphology of the parts, deducing the argument that the first vertebra of the Amphibia is probably to be regarded as a representative of at least two vertebræ, of which the formative blastema has become merged in the occiput in the Amniota. The author also described a stage in the development of the urostyle of *Pelobates*, and showed that, in this batrachian, there is a provisional inversion in the order of development of the urostyle and parts of the precoccygeal vertebræ. He also described a reduced hind limb of *Sala-*

mandra maculosa, in which the reduction and fusion of the parts remaining realized the condition normal for the Urodele limb with numerically reduced digits.—P. L. SCLATER, *Secretary*.

ENTOMOLOGICAL SOCIETY OF LONDON.

March 8, 1893.—HENRY JOHN ELWES, Esq., F.L.S., F.Z.S., President, in the chair.

Mr. Frank E. Beddard, M.A., F.R.S., of the Zoological Gardens, Regent's Park, N.W.; Monsieur Edouard Brabant, of Château de Morenchies, Cambrai, France; Mr. Frank Bromilow, of Avalon, St. Maurice, Nice, France; Mr. Henry Powys Greenwood, F.L.S., of Harnham Cliff, near Salisbury; Mr. Frederick Michael Halford, of 6, Pembroke Place, W.; Lieutenant-Colonel Leonard Howard L. Irby, F.L.S., of 41, Cornwall Terrace, Regent's Park, N.W.; Mr. Bertram S. Ogle, of Steeple Acton, Oxfordshire; Herr Wilhelm Paulcke, of 33, Langstrasse, Baden-Baden, Germany; Mr. Louis B. Prout, of 12, Greenwood Road, Dalston, N.E.; and Captain Savile G. Reid, late R.E., of Foyle House, Alton, Hants, were elected Fellows of the Society; and Herr Pastor Wallengren, of Farhult, bei Höganäs, Sweden, and Herr Hofrath Dr. Carl Brunner von-Wattenwyl, of Vienna, were elected Honorary Fellows of the Society to fill the vacancies in the list of Honorary Fellows caused by the deaths of Professor Hermann Carl Conrad Burmeister and Dr. Carl August Dohrn.

Dr. D. Sharp exhibited a species of *Enoplotrupes* from Siam, which was believed to be new, and which he thought Mr. Lewis intended to describe under the name of *E. principalis*. This insect had great power of making a noise, and the female seemed in this respect to surpass the male.

Mr. W. F. H. Blandford said he wished to supplement the remarks which he made at the meeting of the Society on the 8th of February last on the larva of *Rhynchophorus*. He stated that he had since found that only the first seven pairs of abdominal stigmata were rudimentary. The posterior pair were well developed and displaced on to the dorsum of their segment, which was thickly chitinated, and bore a deep depression, on the margins of which the spiracles were situated. He suggested that the absence of lateral spiracles was perhaps correlated with the wetness of the larval burrows, and that it was a displacement of the posterior stigmata, usually supposed to be restricted to aquatic coleopterous larvæ. He added that dissection showed that the posterior pair were the principal agents of respiration. Dr. Sharp and Mr. Champion made some remarks on the subject.

Mr. W. H. B. Fletcher exhibited a long series of bred *Zygana lonicera* and *Z. trifolii*, hybrids of the first generation with the following parentage:—*Z. lonicera*, male—*Z. trifolii*, female; *Z. trifolii*, male—*Z. lonicera*,

female; also hybrids of the second generation between *Z. trifolii*—hybrid, and *Z. lonicera*—hybrid. The President enquired whether the hybrids were robust and healthy or the reverse. Mr. Fletcher stated that many of the hybrids were larger than the parent species, and that some hybrids between *Z. lonicera* and *Z. filipendula* were the largest he had ever seen. He added that *Zygæna meliloti* would not hybridise with *Z. lonicera*, *Z. trifolii*, or *Z. filipendula*. Mr. Barrett and Mr. Tutt continued the discussion.

Mr. F. W. Frohawk exhibited a bred series of *Vanessa atalanta*, showing the amount of variation in the red band on the fore wings of the female. In seven specimens there was a white spot on this band, and in ten specimens it was absent.

Mr. Elwes exhibited a large number of specimens of *Chrysophanus phlaas* from various places in Europe, Asia, and North America, with the object of showing that the species is scarcely affected by variations of temperature, which was contrary to the opinion expressed by Mr. Merrifield in his recent paper, "On the effects of temperature in the pupal stage on colouring." Mr. McLachlan, Mr. A. J. Chitty, Mr. Bethune-Baker, Mr. Tutt, Mr. Barrett, and Mr. Frohawk took part in the discussion which ensued.

Dr. Sharp read a paper entitled "On Stridulating Ants." He said that examination revealed the existence in ants of the most perfect stridulating or sound-producing organs yet discovered in insects, which are situated on the 2nd and 3rd segments of the abdomen of certain species. He was of opinion that the structures which Sir John Lubbock thought might be stridulating organs in *Lasius flavus* were not really such, but merely a portion of the general sculpture of the surface. Dr. Sharp said that the sounds produced were of the greatest delicacy, and Mr. Goss had been in communication with Mr. W. H. Preece, F.R.S., with the view of ascertaining whether the microphone would assist the human ear in the detection of sounds produced by ants. Mr. Preece had stated that the microphone did not magnify, but merely reproduced sound; and that the only sounds made by ants which he had been able to detect by means of the instrument were due to the mechanical disturbance produced by the motion of the insects over the microphone. A long discussion ensued, in which the President, Canon Fowler, and Messrs. Champion, McLachlan, Goss, Hampson, Barrett, Jacoby, and Burns took part.

Mr. C. J. Gahan read a paper entitled "Notes on the Longicornia of Australia and Tasmania, Part I.; including a list of the species collected by Mr. J. J. Walker, R.N., and descriptions of new forms."—H. Goss and W. W. FOWLER, *Hon. Secretaries*.

